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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/756,771	01/14/2004	Kunikazu Kuchino	KUCH3002/EM	2338

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EXAMINER	
KITOV, ZEEV V	

ART UNIT	PAPER NUMBER
2836	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/756,771	KUCHINO ET AL.	
	Examiner	Art Unit	
	ZEEV KITOV	2836	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 3, 11, 14 - 20, 23 - 28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 - 3, 11, 14 - 20, 23 - 28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Examiner acknowledges a submission of the amendment and arguments filed on December 17, 2008. Claims 6, 9, 10 and 22 are deleted; Claims 1 and 15 are amended. A new Office Action follows.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji (US 6,159,421) in view of Hirano (US 6,774,561). Regarding Claim 1, Fuji discloses following: a photoelectron generating plate (2 in Fig. 4) comprising a photoelectron emission layer on a substrate (col. 9, line 28 – col. 10, line 7) for emitting photoelectrons by an illumination of a light (1 in Fig. 4) and inherently having a barrier property. It is well known in the art and supported by the evidence from on-line Encyclopedia Answers.com as follows: "When a metallic surface is exposed to electromagnetic radiation above a threshold frequency (which is specific to the surface of the material), the photons are absorbed and current is produced. No electrons are emitted for radiation with a frequency below that of the threshold because the electrons are unable to gain sufficient energy to overcome the electrostatic barrier presented by

the termination of the crystalline surface (the material's work function). By the law of conservation of energy, the electron absorbs the energy of the photon and if sufficient, the electron can escape the material with a finite kinetic energy".

Fuji further discloses the photoelectron emission layer being made of a ceramic material such as titanium carbide (col. 19, lines 1 – 21).

As per limitation requiring the thickness of the photoelectron layer being greater than a maximum surface roughness of the underlying layer, Hirano discloses a light emitting device having a metal film (2 in Fig. 1) being covered by a buffering thin film (3 in Fig. 1). Ac cording to Hirano (co4, lines 30 – 39), a thickness of the thin film is set as follows: "the buffering thin film 3 should be as thin as possible (about 10 nm, for example) so long as it covers the surface roughness of the metal film 2". It would have been obvious to one of ordinary skill in the art at the time the invention was made to set a thickness of the photoelectron emitting layer larger than the roughness of the underlying layer since, otherwise the photoelectron emitting layer would have too rough and uneven surface and therefore would not be able to efficiently emit electrons when being irradiated by the light source due to at least reduction in the efficient surface area.

Regarding Claim 11, Fuji discloses the device having the photoelectron generating plate (2 in Fig. 6) and a light source for emitting the light (1 in Fig. 6).

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Ogawa et al. (US 6,106,955). Regarding Claims 2, and 3 Ogawa et al. disclose the photo-catalytic structure with a conductive substrate (12 in Fig. 1), which is

being formed of stainless steel (col. 3, lines 45 – 56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Fuji structure by using the stainless steel as a substrate a material, because (I) according to Ogawa et al. (col. 8, lines 48 – 51), such selection makes possible to form a second (intermediate) layer by anodizing another material on the substrate surface thus forming a strong bond resistant to peeling, and (II) when the stainless steel substrate is used in the Fuji structure, it may be used as an electrode for forming an electrostatic field trap for negatively charged particles between the substrate and active electrode.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Hayashi et al. (JP 2001187390). Regarding Claim 14, Hayashi et al. disclose the oxygen gas running through the surface of photoelectron generating plate (see Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the oxygen gas flowing into photoelectron generating plate in order to form the ozone since, as well known in the art, the ozone helps to purify the liquids and gases.

Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Watanabe et al. (US 5,853,866) or Greenberg et al. (US 7,049,002). Regarding Claim 15, Watanabe et al. disclose a photo-catalytic formation (Fig. 9, col. 9, lines 13 - 19) including three layers, the substrate (1 in Fig. 9), a second intermediate layer on a top of the substrate (6 in Fig. 9) and photo-catalytic layer (2 in Fig. 9)

producing the photo-catalytic effect, i.e. being irradiated with ultra-violet light it produces a purifying effect in the air (col. 1, lines 14 – 58). Watanabe et al. were not certain regarding a nature of the obtained antibacterial effect in the air and developed they own theory as to how the antibacterial effect is achieved (col. 9, line 58 – col., 10, line 14). However, as well known in the art, the ionized air with dominating negative particles produces the same antibacterial effect. Therefore, it is quite clear that the antibacterial effect of Watanabe is achieved due to ionization of the air, i.e. due to emission of electrons into the air under influence of the ultra-violet radiation.

The intermediate layer of the disclosed structure is a binder layer (6 in Fig. 9), which as all other elements and materials posses an electrostatic potential barrier (see Claim 1 rejection above), since otherwise, it would be loosing its electrons by a free emission into the air even without being irradiated, which is not the case. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Fuji et al. system by adding the intermediate layer according to teachings of Watanabe et al., because it is necessary for binding the substrate and photo-catalytic layer together and provide an isolation between the substrate and the photo-catalytic layer.

Alternatively, Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Greenberg et al. (US 7,049,002). Regarding Claim 15, Greenberg et al. disclose a photo-catalytic structure including three-layers with a barrier (intermediate) layer having a barrier property on a substrate (22 in Fig. 2) and a photoelectron emission layer (24 in Fig. 2) disposed on the barrier layer and emitting photoelectrons

under illumination of a light thereon. According to Greenberg et al., the upper layer may be formed of titanium dioxide, which as well known in the art posses the photo-emitting properties being subjected to ultraviolet radiation. As to barrier properties of the intermediate layer, according to Greenberg et al. (col. 10, lines 1 – 6), may be formed of amorphous or crystalline metal oxides including cobalt oxides, chromium oxides and iron oxides, tin oxides, silicon oxides, titanium oxides, zirconium oxides, fluorine-doped tin oxides, aluminum oxides, magnesium oxides, zinc oxides, i.e. the elements, which as well known in the art, inherently posses the barrier feature. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Fuji structure by providing an additional (intermediate) layer according to teachings of Greenberg et al., because as Greenberg et al. state (col. 9, lines 56 – 67) it provides an isolation thus preventing sodium ions migration from the substrate to the upper layer coating.

Regarding Claim 16, Watanabe et al. discloses the barrier layer (intermediate layer 6 in Fig. 9) containing the same photo-catalytic particles (3 in Fig. 9) as the photo-catalytic layer (2 in Fig. 9). Fuji discloses the photo-catalytic material including aluminum oxide Al_2O_3 or TiO_2, (col. 19, lines 1 – 21). Therefore in the Fuji system modified according to teachings of Watanabe et al., the barrier (intermediate) layer will include the aluminum oxide. A motivation for modification of the primary reference is the same as above.

Claims 17, 19, 20, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Greenberg et al. and Ogawa et al. (US 6,106,955). Regarding Claims 2, 19 and 20, Ogawa et al. disclose the photo-catalytic structure with a conductive substrate (12 in Fig. 1), which is being formed of stainless steel (col. 3, lines 45 – 56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Fuji structure by using the stainless steel as a substrate a material, because (I) according to Ogawa et al. (col. 8, lines 48 – 51), such selection makes possible to form a second (intermediate) layer by anodizing another material on the substrate surface thus forming a strong bond resistant to peeling, and (II) when the stainless steel substrate is used in the Fuji structure, it may be used as an electrode for forming an electrostatic field trap for negatively charged particles between the substrate and active electrode.

Regarding Claim 23, Fuji discloses the light source for emitting the light (1 in Fig. 6).

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Greenberg et al., Ogawa et al. and Hayashi et al. (JP 2001187390). Regarding Claim 14, Hayashi et al. disclose the oxygen gas running through the surface of photoelectron generating plate (see Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the oxygen gas flowing into photoelectron generating plate in order to form the ozone since, as well known in the art, the ozone helps to purify the liquids and gases.

Claim 25 - 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Kim et al. (US 4,713,548) Regarding Claim 25, Fuji discloses a mesh-shaped photoelectron generating member (col. 6, lines 21 – 29). It further discloses the electron emitter (45 in Fig. 23) and electrode (51 in Fig. 23) having opposite electrical potentials. It further discloses the photoelectron generating member (photoelectron emitter) being installed in the vessel so that the air flowing in the vessel impinges onto the photoelectron generating member (shown in Fig. 14).

According to Fuji (col. 20, lines 40 - 47), the strength of electric field may be up to 2kV/cm, and therefore, substantially high voltages are applied to the electrodes. Elementary rules of electrical safety require grounding one of the electrodes. Kim et al. disclose grounding a positive electrode (40 in Fig. 1) and alternatively grounding the negatively charged photoelectron emitter (20 in Fig. 2) through a wire (25 in Fig. 2, col. 4, lines 29 - 30). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified the Fuji system by grounding one of the electrodes, particularly the photoelectron emitter because such grounding is necessary to ensure electrical safety of the device since it uses substantially high voltages.

All other elements of the claim are disclosed above (see Claim 1 rejection above).

Regarding Claim 26, Fiji discloses the light source generating an ultraviolet light (1 in Fig. 25).

Regarding Claim 27, Fuji discloses a structure including an ultraviolet lamp (1 in Fig. 25) surrounded by a mesh electrode (51 in Fig. 25) which is read on a mesh-shaped conductive member, which, in turn, is surrounded by a ceramic member 47 in Fig. 25) having a photocatalyst (in Fig. 25) 2 and a photoelectron emitter (45 in Fig. 25) attached thereto.

Regarding Claim 28, Fuji discloses the ventilator (Fan) (34 in Fig. 14) providing the air flow to the photoelectron generating device, which according to him may include a mesh-shaped photocatalytic layer (col. 6, lines 21 – 29).

Claims 16 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Ogawa and Greenberg et al. Regarding Claims 16 and 17, Greenberg et al. disclose the barrier (intermediate layer being formed of aluminum oxide (col. 10, lines 1 – 6), which is inherently conductive. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the barrier of aluminum oxide, which is conductive material, because the aluminum oxide is one of the list of materials satisfying both requirements, i.e. providing a good barrier for sodium ions diffusion and at the same time providing a good surface suitable for deposition of the titanium dioxide (col. 2, lines 49 – 59).

Regarding Claim 18, Greenberg et al. disclose the barrier (intermediate) layer being formed of tin oxide (col. 10, lines 1 – 6).

Response to Arguments

Applicant's arguments have been considered but are mostly moot in view of the new ground(s) of rejection. However, some of them are to be addressed.

Applicant's top labels on the Arguments and the Amended Claims text wrongly identify the case as 10/072,422. However, since the Arguments and the Amended Claims fit the instant case it was assumed that despite wrong label they belong to the instant case and were treated accordingly.

Examiner admits that Fuji patent does not disclose "a thickness of the photoelectron emission layer is greater than a maximum surface roughness of an underlying layer". However, as stated in the Office Action, this feature is disclosed by Hirano.

Applicant attacks the motivation for modification of the Fuji reference and provides his own reasons for such modification as follows: "In accordance with the present invention, by setting the thickness of the photoelectron emission layer to be greater than a maximum surface roughness of an underlying layer thereof, the surface of the photoelectron emission layer in the photoelectron generating plate is prevented from being coated by compounds defused through pinholes in the photoelectron emission layer. Thus the negative particle generating device always maintains a level of the amount of negative particles and the photoelectron generating plate attains a good durability for a long time". In other words, the Applicant has different reasons for modification of the Fuji design. In response to applicant's argument: "the surface of the photoelectron emission layer in the photoelectron generating plate is prevented from

being coated by compounds defused through pinholes in the photoelectron emission layer" the fact that applicant has recognized another advantage, which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zeev Kitov whose current telephone number is (571) 272 - 2052. The examiner can normally be reached on 8:00 – 4:30. If attempts to reach examiner by telephone are unsuccessful, the examiner's supervisor, Michael Sherry can be reached on (571) 272 – 2800, Ext. 36. The fax phone number for organization where this application or proceedings is assigned is (571) 273-8300 for all communications.

/Z. K./
Examiner, Art Unit 2836
2/18/2009

/Stephen W Jackson/
Primary Examiner, Art Unit 2836